

Information on Constructed IDs Webinar

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Outline

- Objectives
- Policy
- Methodology
 - Constructed ID standards and rules
 - Limitations and foreign pedigree
 - Reports and notification
- Impact on evaluations
- Summary
- Q&A session



Objectives

- Share the details around this new procedure of adding genomically discovered maternal grandsires (MGS) and maternal great grandsires (MGGS) to pedigrees
- Provide information so all stakeholders can handle and incorporate the Constructed IDs into their internal processes and customer communications
- Disseminate information to facilitate the implementation, recognition and adoption of Constructed IDs across the industry
- Receive feedback from our collaborators
- Respond to questions and concerns

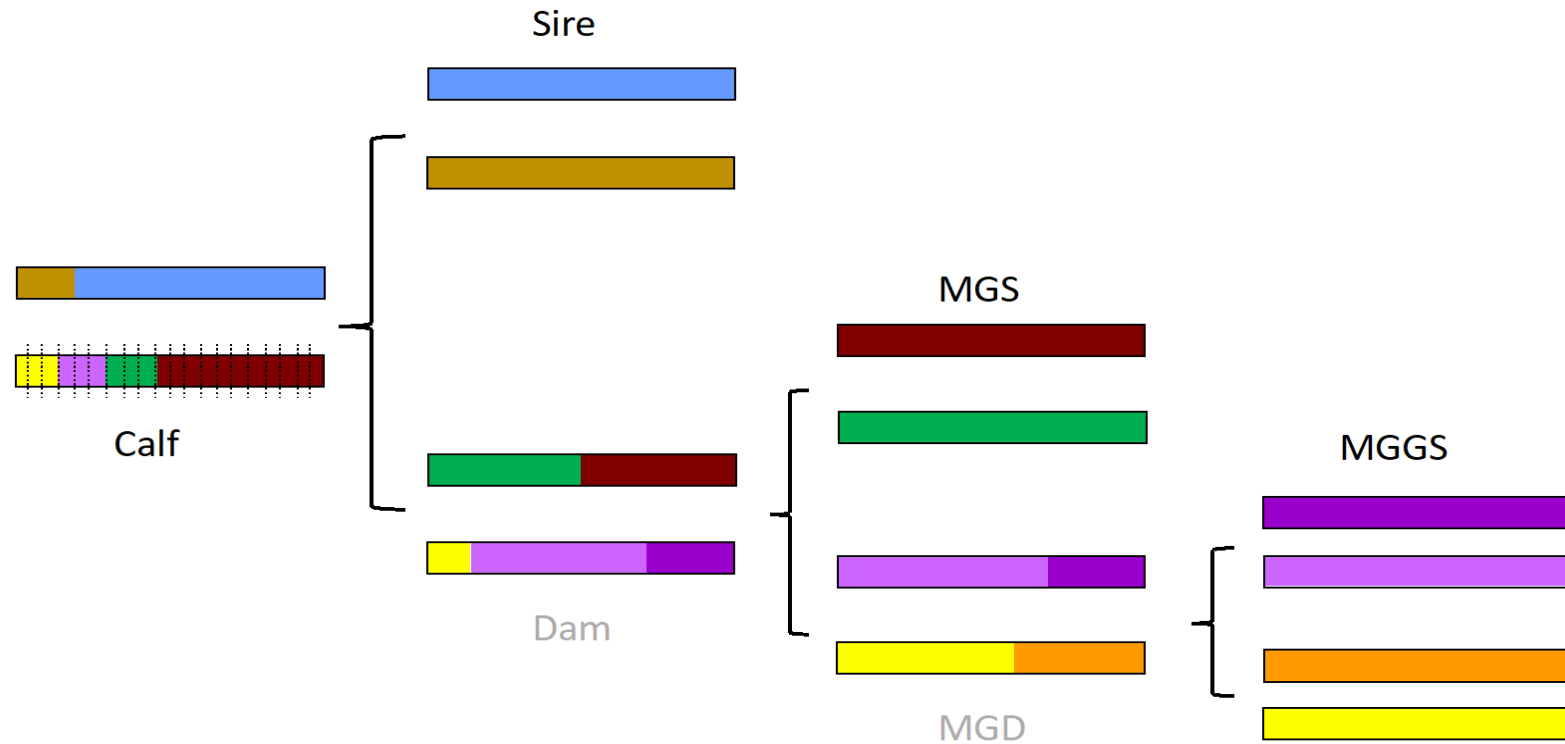
Adding genomically discovered maternal grandsire (MGS) and maternal great grandsires (MGGS) to pedigrees

- The policy was approved by the CDCB Board of Directors on 08/25/2021
- Implementation and communication plan approved on 12/14/2022
- Policy can be accessed at: <https://redmine.uscdcb.com/projects/cdcb-policies-and-regulations/wiki#Adding-genomically-discovered-maternal-grandsires-MGS-and-maternal-great-grandsires-MGGS-to-pedigrees-policy>

Methodology

Discovering pedigrees

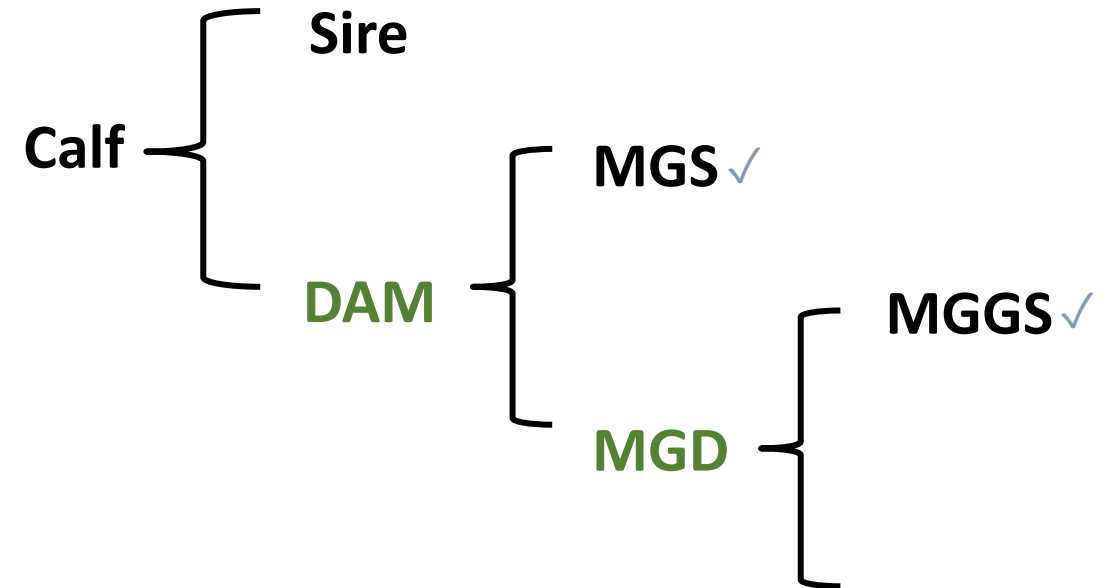
Fixped.f90 uses haplotypes to discover distant relationships as MGS and MGGS when DAM is missing or not reported (VanRaden et al., 2013)



https://aipl.arsusda.gov/publish/jds/2013/96_1874.pdf

Linking pedigree information

- Creating a Constructed dam or maternal granddam (MGD) ID allows animals with no dam ID to be linked to their discovered MGS and MGGS



Filling in pedigrees

➤ First check if true dam can be discovered in same herd

- Match birth and fresh dates, only 1 dam's pedigree matches calf's (only non-ambiguous cases are filled)

Already discovered and added 400,000 MGS and MGGS whose dam ID and MGD ID were already reported by the owners

Filling in pedigrees – Ancestors to add

- **Dams** - discovered by Sire, Service Sire, herd & calving date
- **Sires** discovered as MGS of progeny
- **MGS & MGGS** using Constructed Dams and MGD

Filling in pedigrees

Constructed ID: HO USA DAM (MGD) base animal's internal numeric ID (key)

HOLUSAFDAM087654321

Dam of HO840003211394853

- All Constructed IDs will have **USA** as country code because **ONLY CDCB generates them**
- **For international IDs**, the only difference will be the 3-letter breed code (HOL instead of HO) and the addition of the sex (F) after the country code
- **To further facilitate the Constructed ID recognition**, the name of each constructed animal will be “**Dam of [ID of source animal]**” or “**MGD of [ID of source animal]**”

Constructed IDs standards

- **Unique:** must be unique in the pedigree, as they are only used to link source animals to their ancestors
- **Traceable:** must be connected to the source animal from which it was derived (and the country that generated it).
- **Stable:** The connection between the Constructed ID and its source animal must be perpetual – unless the true ancestor is found.
- **Recognizable:** must be easily recognizable as placeholders and never be considered as the ID of a true ancestor.

Constructed IDs rules

- **Constructed IDs** will **ONLY** be generated by the CDCB and will have source code “A”
- Other submitters can modify the record as usual, but with limitations on Constructed IDs
 - Submitters will **ONLY** be allowed to replace constructed IDs with a true ancestor ID or delete the Constructed ID if they reject the connection to the MGS or the MGGS
 - Users are **NOT** allowed to replace constructed IDs with alternative Constructed IDs

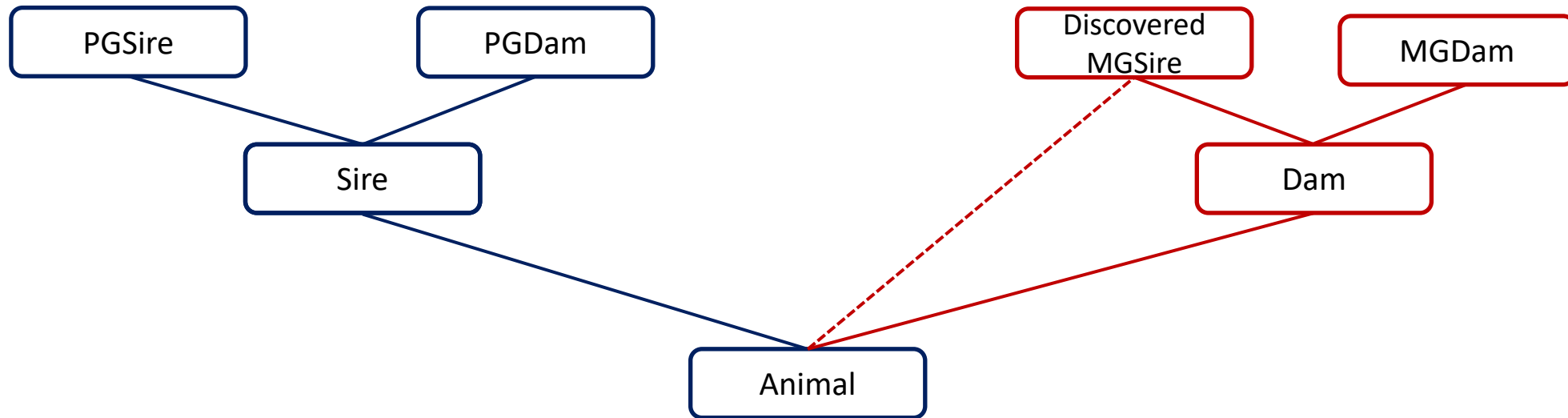
Limitations

- Breed source pedigree **only** updated by adding Constructed DAM/MGD
- Updating done 3 days after notifications distributed to allow updates from the field to avoid Constructed IDs
- Deleted parent will **NOT** be refilled by CDCB

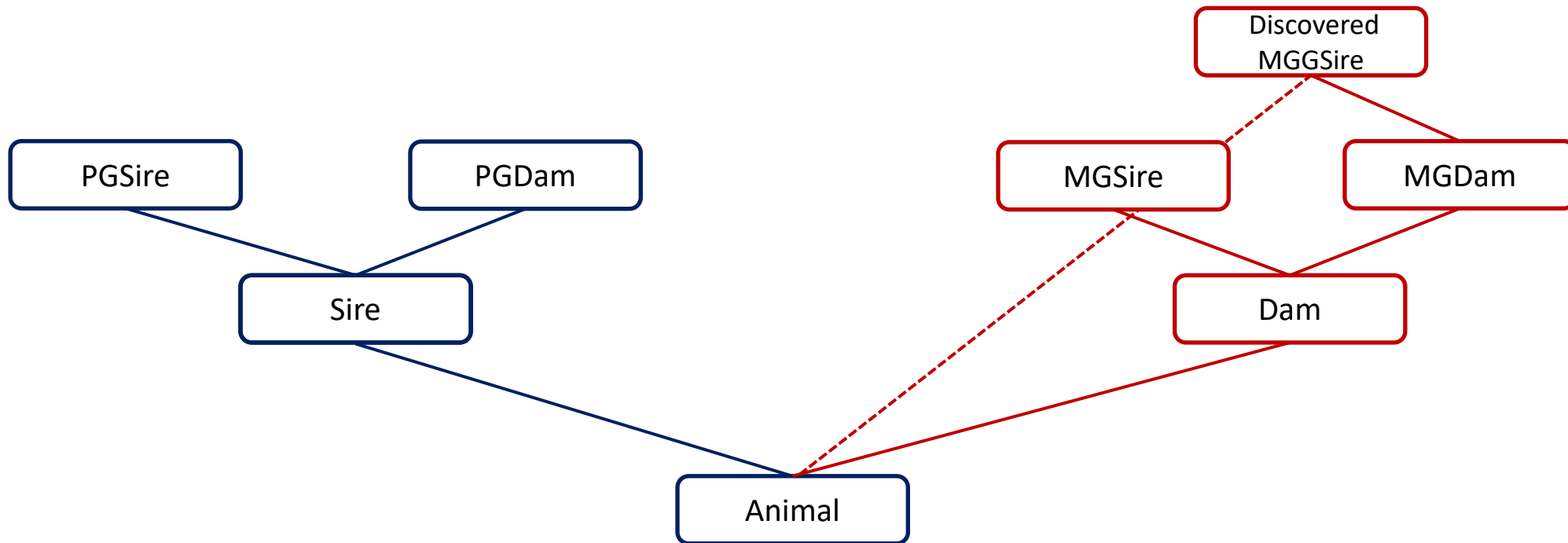
Foreign pedigree

- Pedigree requested from **GBR, AUS, ITA, CHE & DEU**
- Used to fill in missing pedigree, but **NOT** to restore previously deleted dams or discovered MGS
- After applying foreign data, Constructed IDs used for remaining updates

Dam known, sire unknown, discovered MGS stored as Dam's Sire

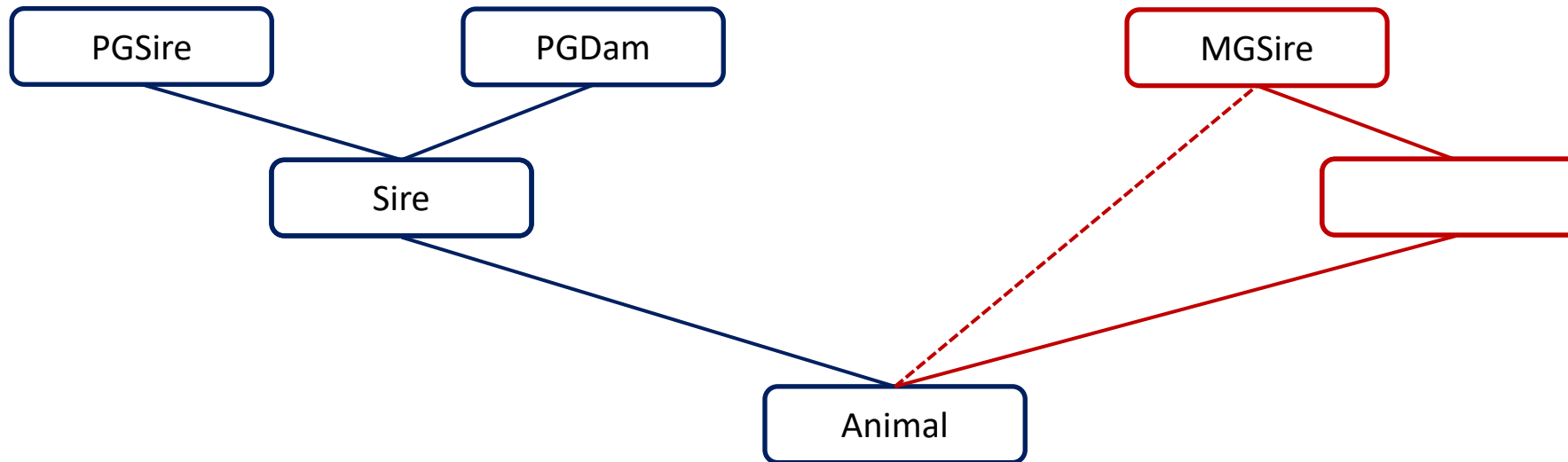


MGD known, discovered MGGS added as her sire

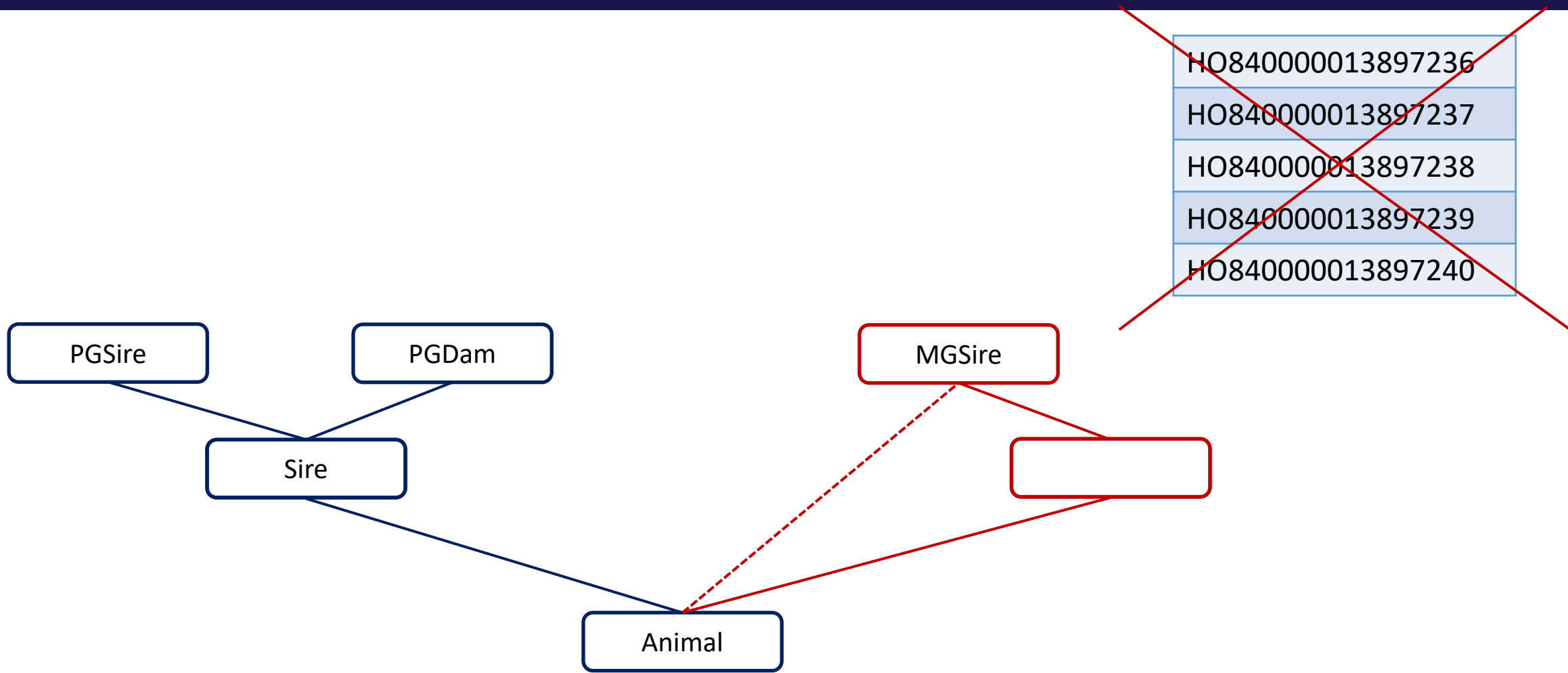


Dam unknown; Dam suggested based on herd, sire, and calving date

HO840000013897236
HO840000013897237
HO840000013897238
HO840000013897239
HO840000013897240



Dam unknown; Dam ID constructed, and pedigree created with discovered MGS as sire



Reports and notifications

- **Format 1** pedigree records provided with additional fields to indicate genotyped animal whose ancestors are being added
- Sent to breed association and DRPC to facilitate consistent pedigree across industry

Impact on evaluations

- CDCB performed a full test-run (traditional and genomics) in November 2022 to assess the impact of the **full** implementation of discovered pedigrees
 - This will NOT happen, as there will be a gradual implementation throughout 2023
- *AI bulls*: **Nearly no impact**, some marginal variation on some bulls adding a lot of daughters
- *Animals adding pedigrees*: variable impact depending on the type of pedigree changes and discovered MGS/MGGS. Large increase in reliability (e.g., better predictions!)
- Results in line with Nani et al., even if the number of inclusions was around 3 times more

Key points about this change

- This is another example of U.S. leadership to gain advantages of genotyping and genomic discovery
- The implementation of the Constructed IDs will occur gradually (infrastructure limitations). The Constructed IDs will not be reflected for all affected animals immediately, it will be gradually
- Effective Feb 14, 2023, all evaluation and service results will start reporting the Constructed IDs. The full database sweep and implementation will require a few months (applied in batches)
- Nominators and collaborators should prepare to incorporate and handle the Constructed IDs to their internal processes
- Collaborators are encouraged to develop communications that explain to their customers about the use, benefits and possible implications of the Constructed IDs
- CDCB is providing an article, FAQ and other resources to support this.

Summary

- Complete pedigrees can assure accuracy and consistency of genomic and pedigree data
- Linking disconnected animals improves genetic and genomic estimations
- Identifying pedigree errors can help to make better mating decisions
- Real dam IDs are preferred over Constructed IDs unless it does not match the calf and grandsire
- Pedigree providers have the option to remove/reject discovered relationships

Thank you!



Q&A

- **Will constructed dams be included in the genomic and 105 genetic prediction files? That is, both as a dam and having their own record?**
I propose that the ID be included in the progeny's evaluation record, but I do not see a need to report evaluations on constructed IDs themselves as there is no known animal to select
- **If a genotype is assigned to an animal, and a constructed dam added, then the genotype is withdraw or moved, will the constructed dam be removed (destroyed) from the original record?**
No code has been generated to do this. It would be reasonable to have code to remove a stale constructed ID so it does not prevent intended data from being accepted later.
- **Will you store an imputed genotype for a constructed dam?**
We only allow a constructed ID to have 1 progeny, so imputed genotypes will not be generated. We do not store imputed genotypes in our database tables.
- **After a pedigree edit, how long does it take to re-analyze constructed dams?**
Constructed IDs will have an impact on the monthly evaluation the following month. Constructed IDs added following a weekly evaluation will affect the following monthly. The weekly evaluation calculated the same week as the monthly, will not constitute to that monthly.
- **What happens to a constructed when she is replaced by the real dam? Does she still exist with the "progeny" key?**
If a constructed ID was re-IDed to a new valid ID, the constructed ID would be deleted, but the internal anim_key would not be changed.